

PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Process for Preparing Ammonium Sulphate Nitrate

We, FISONS FERTILIZERS LIMITED, a British Company, of Harvest House, Felixstowe, Suffolk, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to fertilizers based on ammonium sulphate nitrate.

Ammonium sulphate nitrate is a homogeneous solid and is formed from mixtures of ammonium nitrate and ammonium sulphate perhaps with a little ammonium bisulphate. Mixtures of ammonium nitrate and ammonium sulphate melt at temperatures around 178°C provided that the mixture contains at least 8% by weight of ammonium sulphate. Mixtures of ammonium nitrate and ammonium sulphate containing less than 8% by weight of ammonium sulphate melt at temperatures in the range 167—178°C.

In sharp contrast to the behaviour of mixtures of ammonium nitrate and ammonium sulphate on melting, mixtures of ammonium nitrate and ammonium bisulphate, optionally containing ammonium sulphate, are found to melt at temperatures well below 170° and may in fact melt at temperatures as low as 80°C. The present invention is based on the discovery that low melting point mixtures containing ammonium nitrate, ammonium bisulphate and optionally ammonium sulphate may be readily formed into granules and simultaneously ammoniated to give ammonium sulphate nitrate.

Accordingly the present invention is for a process for preparing ammonium sulphate nitrate, which comprises forming a molten mixture comprising ammonium nitrate, ammonium bisulphate and, optionally, up to 16% by weight of the mixture of ammonium

sulphate, flaking or granulating said molten mixture and, simultaneously, ammoniating to ammonium sulphate nitrate.

In the process of the present invention the molten mixture may be flaked by running it on to a cooled surface. A suitable surface would be that provided by, for example, flaking rolls, the ammonium sulphate nitrate being recovered as flakes.

Preferably however the molten mixture is granulated by spraying it on to a particulate base material in a rotating drum and recovering the ammonium sulphate nitrate as granules. The base material may be at an elevated temperature for example 60—90°C and may comprise granules containing fertilizer or inert materials or the base material may comprise fines. In the former case a surface coating of ammonium sulphate nitrate is formed on the granules. In the latter case the fines may be granulated by the process. If fines form the base material the fines may be composed of recycled undersize and ground oversize from a previous granulation stage.

The ammoniation stage of the present invention is accomplished during flaking or granulating of the molten mixture. This ammoniation is continued until ammonium sulphate nitrate is formed. The heat of ammoniation will assist in the granulation when this is performed.

The molten mixture of ammonium nitrate and ammonium bisulphate may be formed by mixing ammonium nitrate and ammonium bisulphate and raising the temperature. Ammonium sulphate may be added to this mixture.

Suitably the molten mixture comprising ammonium nitrate, ammonium bisulphate and, optionally, ammonium sulphate is formed by a process which comprises ammoniating a mixture containing nitrate and sulphate anions,

[Price 4s. 6d.]

hydrogen cations and, optionally ammonium cations. Preferably the molten mixture comprising ammonium nitrate and ammonium bisulphate is formed by a process which comprises ammoniating a mixture containing ammonium nitrate and sulphuric acid. The ammonium nitrate may be a concentrated solution for example 86% to 95% concentration. In this ammoniation sufficient heat is normally evolved to provide a melt of the requisite low moisture content but if necessary the moisture content can be reduced in a separate drying step.

The mole ratio of ammonium nitrate to ammonium bisulphate in the molten mixture is suitably in the range 0.9:1 to 4:1. Preferably the mole ratio of ammonium nitrate and ammonium bisulphate is in the range 1:1 to 2.2:1.

The temperature of the molten mixture comprising ammonium nitrate and ammonium bisulphate will depend on the composition of the mixture, being a minimum when ammonium nitrate and ammonium bisulphate are present in eutectic proportions. Usefully the temperature of the melt is in the range 90°C to 120°C.

A small amount of water may be present in the molten mixture but preferably the amount of water is minimised in order to avoid subsequent drying operations. During ammoniation of the molten mixture while flaking, prilling or granulating a certain amount of heat is evolved which serves to finally dry the product ammonium sulphate nitrate.

EXAMPLE 1

1,000 parts by weight of a melt containing ammonium nitrate and ammonium bisulphate in the mole ratio of 1.6 moles of ammonium nitrate to 1.0 mole of ammonium bisulphate was sprayed at 110°C on to 800 parts by weight of fines in a granulating drum. The fines were screened to pass a 1/16th inch sieve and were at a temperature of 80°C. Ammonia was passed through the drum at the rate of 20 litres per minute for 4.5 minutes.

The resulting granules were sieved and product-size granules were analysed. The composition of the granules was:

Ammonium nitrate	47.7 %
Ammonium sulphate	44.4 %
Ammonium bisulphate	7.84 %
Total N	27.14 %

EXAMPLE 2

The process according to Example 1 was repeated except the temperature of the melt was 100°C and the temperature of the fines was 70°C.

The composition of the product-size granules was found to be:

Ammonium nitrate	50.5 %	
Ammonium sulphate	39.5 %	
Ammonium bisulphate	10.1 %	
Total N	27.17 %	65

EXAMPLE 3

A mixture of ammonium nitrate and sulphuric acid was ammoniated until a melt was formed which only just did not form a precipitate. This melt was sprayed at 115°C on to fines at 80°C as described in Example 1.

The composition of the melt was as follows:

Ammonium nitrate	52.08 %	
Ammonium sulphate	8.23 %	
Ammonium bisulphate	39.64 %	75

The composition of the product-size granules was:

Ammonium nitrate	45.02 %	
Ammonium sulphate	48.7 %	
Ammonium bisulphate	6.29 %	80
Total N	26.85 %	

WHAT WE CLAIM IS:—

1) A process for preparing ammonium sulphate nitrate which comprises forming a molten mixture comprising ammonium nitrate, ammonium bisulphate and optionally up to 16% by weight of the mixture of ammonium sulphate, flaking or granulating said molten mixture and simultaneously, ammoniating said mixture to form ammonium sulphate nitrate.

2) A process as claimed in claim 1 wherein said molten mixture is granulated by a process which comprises running the molten mixture on to a cooled surface.

3) A process as claimed in claim 1 wherein said molten mixture is granulated by spraying it on to a particulate base material in a rotating drum and recovering the ammonium sulphate nitrate as granules.

4) A process as claimed in claim 3 wherein the base material is at a temperature in the range 60—90°C.

5) A process as claimed in claim 3 or claim 4 wherein said base material comprises granules containing fertilizer or inert materials.

6) A process as claimed in claim 3 or claim 4 wherein said base material comprises recycle fines.

7) A process as claimed in any of the preceding claims wherein the mole ratio of ammonium nitrate to ammonium bisulphate in the molten mixture is in the range 0.9:1 to 4:1.

8) A process as claimed in any of the preceding claims wherein the mole ratio of ammonium nitrate to ammonium bisulphate in the molten mixture is in the range 1:1 to 2.2:1.

9) A process substantially as hereinbefore described with reference to the examples.

10) Ammonium sulphate nitrate when pre-

pared by the process as claimed in any of
the preceding claims.

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